CHALLENGES OF URBAN GARDEN INITIATIVES FOR FOOD SECURITY IN KUALA LUMPUR, MALAYSIA

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Abstract: Sustainable urban farming is a strategy to improve food availability and food access, and to support food security for the urban population in Malaysia. However, the development of these activities has been affected by several constraints. This article aims to identify the challenges faced by urban farmers in Kuala Lumpur. The challenges of practicing urban gardening were categorised into five groups (technical, resource-related, economic, social and environmental factors). Data were collected via a questionnaire survey distributed to 106 urban farming practitioners from 17 urban gardens in Kuala Lumpur and were analysed using descriptive analysis by tabulating the frequency and percentage. The result showed that highly fluctuating weather, problems with access to available land and financial problems were the main challenges faced by urban farmers in Kuala Lumpur. Furthermore, difficulty in access to a financial institution, lack of commitment and the increased number of pests were also the problems faced by the urban garden. Availability of technical factors is the least issue in this study. Correlation analysis was used to determine the relationship between the challenges of urban gardens and socio-demographics. The result showed that there was a weak correlation between technical factors of educational level (r = 0.225) and race (r = 0.210), respectively, as well as between race and social factor (r = 0.201), while there was a moderate correlation between age and environment factor (r = −0.410). There is a need for further work, and comprehensive research should be conducted to capture what actions can be taken to create a policy-making space for urban farmers.

Keywords: community, food security, obstacle, sustainable, urban agriculture

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Introduction

The World Food Summit in 1996 agreed that food security materialises when all people can access sufficient, safe and nutritious food that meets their dietary needs for active and healthy life (Pinstrup-Andersen 2009). However, many factors contribute to food insecurity. A study by

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Ihab et al. (2013) revealed that 83.9% of households in Bachok, Kelantan, faced food insecurity because of large household size, food expenditure and low monthly income. Food will become unaffordable, particularly for urban residents with lower income, and their daily diet will be affected and lead to hunger and malnutrition (Othman et al. 2018). Besides, the increased population and a decline in food products can have an impact on food security in cities (Muhamad et al. 2015). According to the Department of Statistics Malaysia (2016 a, 2016b), the Malaysian population is projected to rise from 28.6 million in 2010 to 41.5 million by 2040. This obviously will decline the availability of domestic food, which will increase the amount of imported food. For instance, the government needed to import food from China and Thailand in 2014 (Ministry of Finance Malaysia 2011), and the cost of imported food increased from RM 8.97 billion in 2012 to RM 17 billion in 2014 (Ministry of International Trade and Industry Malaysia, 2015).

Hence, according to the Ministry of Agriculture and Food Industries, Malaysia, in the 'Program Sentuhan Kasih Tani-Pertanian Bandar 2.0', urban farming is an initiative by the government to enhance food security and ensure a complete food supply chain (New Straits Times, 2018). Urban farming is a strategy for Malaysia's economic and food security (Othman et al. 2018). The urban garden is defined as the growing of food within cities (Ackerman 2012), and is one of the initiatives to ensure that all people in the world are fed (Mok et al. 2014). The engagement of people in urban garden practice ensures that the food sources can be accessed easily and are safe to consume (Alaimo et al. 2008). A previous study by Rezai et al. (2016) shows that availability and accessibility of fresh food among households in Putrajaya improved when they grew vegetables daily. Besides, the other highlighted benefits about this urban garden practice are that it helps in improving mental health and reducing stress and it allows people to plant something that can be consumed safely (Teig et al. 2009). A study in 15 countries by Zezza and Tasciotti (2010) shows that there is a positive change in the dietary diversity and calorie intake among urban people after being involved in urban farming. Furthermore, fluctuating food prices can contribute to food insecurity in cities. According to Mkhawani et al. (2016), the impact of the increase in food price caused 50.0% of households in South Africa to need to spend almost half of their money on food, and it affected their ability to access other important commodities required in the household. This study also states that 15.0% of households needed to borrow money from microlenders. Thus, an urban garden is important to overcome this issue.

Although the urban garden has the potential to support food security and provides many benefits to urban farmers, they should face many challenges, such as fluctuating weather that will have a negative impact on food sources. According to the Food and Agriculture Organization (2015), the most natural hazard affecting the agricultural crop sector is flood, and a study by Jega et al. (2018) shows that floods in Kelantan had an impact on almost all the crops, livestock and agricultural assets. Next is dryness of soil, which reduces soil fertility and stops root growth and causes decomposition of organic material (Ogwuche et al. 2018). Insufficient rainfall and temperature lead to food insecurity all over the world (Milan, Ruano 2014; Generoso 2015). It is in line with the findings of Solaymani (2018), showing that there is a direct correlation between changes in rainfall–temperature and the productivity of agricultural products. Thus, farmers adapt to rainfall variability through the choice of crop and planting dates, adjusting the levels of fertiliser, as well as resorting to cropping in areas with a high water table (Makuvaro et al. 2017).

According to a study by Pourjavid et al. (2013), the top constraint of urban farming in Tehran was high start-up cost and lack of knowledge among urban managers and authorities. Mostly, urban farmers need loans or subsidies to develop urban gardens because these require a large investment in terms of operational cost, infrastructure, energy and management (Valk 2012). Farmers also need to arrange the cost for purchasing fertilisers, pesticides and tools (Dimitri et al. 2016). A finding by Makuvaro et al. (2017) reveals that the shortage of pesticides among farmers is caused by a lack of capital. Besides, less access to loan facilities will increase the impact on farming activities, e.g. for small urban farmers in Africa, Asia and Latin America, in the context of scaling up their production (Cabannes 2012). The high cost of irrigation is one of the issues in urban farming (Kutiwa

et al. 2010; Adedayo, Tunde 2013). Rainwater is another source of water in cities. A study by Moglia (2014) shows that farmers use water from the Kalkallo Stormwater Harvesting and Reuse facility. However, there are possibilities that it may be contaminated with pathogens, heavy metals, excessive nutrients and salinity (Norton-Brandao et al. 2013). Furthermore, the shortage of land in an urban area will affect the urban farmers involved in this practice (Beniston 2016). According to Low (2019), lack of space is one of the challenges for urban farming in Singapore because of the complex and restrictive regulatory legislative framework related to land use.

Other than that, the challenge faced by urban farmers is hard-to-access available land. The agricultural sector needs to compete for the available soil with the residential, industrial and commercial sectors (Duchemin et al. 2009) and most of the available land is owned by private owners (Barthel et al. 2013a). Land, particularly in urban areas, is valuable and highly competitive (Man et al. 2017). Half of the farmers in Accra cultivate their crops not on their land, and private owners only sell to those residential and commercial developers who are the highest bidders (Asomani-Boateng 2002). In addition, illegal urban gardens and recreational urban farming have created conflicts among the farmers, residents and local government (Razak, Roff 2007; Man et al. 2017). Meanwhile, the main challenges faced by urban farmers of nutrition gardens in Mucheke town, Masvingo, are difficulty in securing fertilisers/manure, pests and diseases, and theft (Chimbwanda 2016). Pests and diseases can be influenced by climate change because the rise in temperature and change in rainfall patterns increase the number of fungi and diseases that affect yield production in Malaysia (Rahim 2014). Furthermore, lack of information about market demands and pricing, sudden shortages of products and price instability can be seen as other challenges faced by urban farmers (Man et al. 2017). For instance, intensive training can improve the knowledge among farmers in Nepal, where less-literate farmers cannot use all the information without guidance from extension services (Karki et al. 2011).

In addition, several economic, environmental and social factors can be identified and categorised as the challenging constraints of the urban garden. The constraints are classified based on related factors. In terms of the economic factor, the location of the urban garden far from supermarkets and lack of marketing skills are the challenges faced by urban farmers. A previous study by Aarthi Dhakshana and Rajandran (2017) shows that 27.0% of farmers in Thanjavur faced problems due to lack of marketing techniques. Othman et al. (2017) reveal that the fewest participants are among people younger than 20 years of age because they have the perception that this activity is not profitable to them (Ramaloo et al. 2018). Thus, the aim of this study was to identify the demographic background of target respondents in urban gardens around Kuala Lumpur, to investigate the challenges of urban garden development and to identify the relationship between demographic background and the factors challenging the development of this urban garden practice in Kuala Lumpur, Malaysia.

Materials and methods

Study area

Kuala Lumpur is the capital city of Malaysia and the fastest-growing metropolitan area with 1.78 million people. Kuala Lumpur is located 54 m above sea level, and the annual rainfall in this city is 2,486 mm. Kuala Lumpur has abundant rainfall, especially during the northeast monsoon season from October to March. It has a tropical climate with an average temperature of 27.1°C. Due to rapid urbanisation and increasing population, this city is suitable for urban garden development and supports food security.

Data collection

This was a descriptive survey research carried out at urban gardens that are registered under Local Agenda 21 Kuala Lumpur (LA21 KL). The UN Local Agenda (LA21) was officially implemented in 2005 in Kuala Lumpur to encourage public, private and community partnerships to develop a better city vision. All urban gardens involved in this study are located around Kuala Lumpur (Fig. 1). The primary data were obtained using structured questionnaire surveys. Prior to the survey, a pilot test was conducted to improve the validity and reliability of the survey

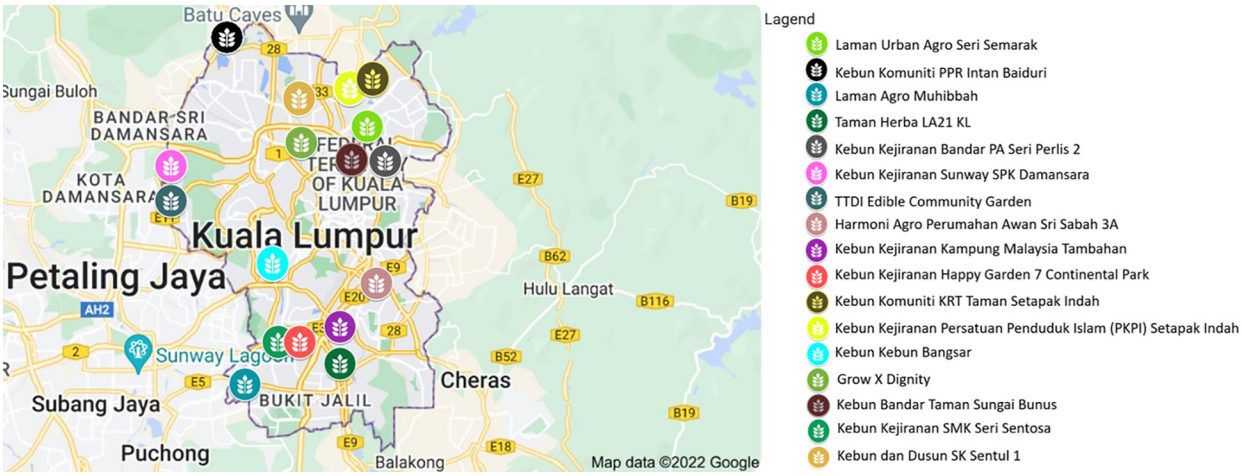

Fig. 1. Map of the locations of all the urban gardens in Kuala Lumpur for the years 2016–2020. Source: Urus Setia Local Agenda 21 Kuala Lumpur, Dewan Bandaraya Kuala Lumpur, Malaysia.

question. The surveys were conducted between January and May 2020 by common survey methods, namely through field data collection (face-to-face interviews) and an online survey method (Kelley et al. 2003; Othman et al. 2018). Because of the movement restriction due to the coronavirus disease (COVID-19) pandemic, this study only involved 106 urban farming practitioners from only 17 urban gardens out of all the urban gardens listed under LA21 KL.

Measurement of variables

The questionnaire was composed of three sections. Section A consisted of the socio-demographic characteristics of the respondents (gender, age, race, educational level, number of households, household income and experience); Section B involved the perspective of the practitioner about the benefits of an urban garden; and Section C asked the questions related to challenges of the urban garden. All the identified constraints and challenges in the urban garden were categorised into five groups: technical, resource-related, economic, social and environmental factors. These constraints were rated by the respondents based on a five-point Likert's scale from '1' to '5', with '1' indicating 'strongly disagree' and '5' indicating 'strongly agree'.

Data analysis

The collected data from completed questionnaires were coded and analysed in Statistical Package for Social Science, IBM SPSS Software Version 26 (IBM corporation, Armonk NY, USA) and tabulated by using frequency and percentage. To assess the reliability of the questionnaire, Cronbach's alpha coefficient was calculated. This coefficient for the main sections of the questionnaire was in the range of $0.644 \leq \alpha \leq 0.848$. Spearman-rho analysis was used to determine the correlation between socio-demographic characteristics and the challenges for the urban garden.

Results

Socio-demographic characteristics of respondents

Table 1 presents the socio-demographic profile of respondents. They are composed of 39 males and 67 females, with percentages of 36.8% and 63.2%, respectively. In terms of the respondents' race, Malay urban farming practitioners constituted the highest percentage (78.3%), followed by the Chinese (14.2%), Indians (3.8%) and others (3.8%). Most of the respondents (48.1%) fell within the age group of 41–60, while 40.6% are in the age group of 15–40. Table 1 also indicates that most of the respondents (57.5%) have completed a tertiary educational level. The result also shows that 47.2% of the respondents are from the lower-income group with a monthly household income of ≤RM 3,000 per month, with four to six family members per household (50.0%). Most

(40.0%) of them have been only involved in this practice for three years.

Table 1. Socio-demographic profile of respondents.

Characteristics	Frequency	Percentage (%)
Gender		
Male	39	36.8
Female	67	63.2
Age		
<15	5	4.7
15–40	43	40.6
41–60	51	48.1
>60	7	6.6
Race		
Malay	83	78.3
Chinese	15	14.2
Indian	4	3.8
Others	4	3.8
Educational level		
Primary school	5	4.7
Secondary school	40	37.7
Tertiary school	61	57.5
Other	0	0.0
Number of people in households		
1–3	38	35.8
4–6	53	50.0
>6	15	14.2
Household income (RM)		
≤3,000	50	47.2
≤6,275	27	25.5
≤13,148	29	27.4
Experience (years)		
<1	26	24.5
<3	45	42.5
<5	19	17.9
>5	16	15.1

Source: own study.

Perspective of practitioners about the benefits of urban gardens

Table 2 shows the perspective of urban farming practitioners regarding the benefits of the urban garden. Based on the results, the majority (98.1%) of the respondents acknowledge that the urban garden is the government's initiative to sustain the urban environment, followed by the building of social relationships among farmers (97.2% of respondents). Meanwhile, the third-highest score (95.3% of respondents) was for the safe production of food sources in the garden, production of more nutritional food and easy access to vegetables and fruits for urban residents.

Prioritising constraints facing urban gardens

Constraints listed in Table 3 have been prioritised by the respondents. Overall, highly fluctuating weather was given the highest rankings by the respondents. Meanwhile, financial problems ranked as the most important constraint after the problems of access to available land. Constraints, such as difficulties with access to training and consultation from the government, difficulties in access to technical support from authorities and non-governmental organisations (NGOs) and limited access to local urban farming information online were among the lowest priorities facing urban agriculture development.

Challenges facing urban gardens

Technical factor

Based on Table 4, the technical factor is not the major challenge in this study: the majority of the

Table 2. Perspective of practitioners on benefits of urban gardens.

Statement	Frequency	Percentage (%)
It is one of the green initiatives by the government to sustain the urban environment.	104	98.1
Building social relationships among farmers	103	97.2
Safe food sources can be produced in the garden.	101	95.3
More nutritional food can be produced from the garden.	101	95.3
Urban people can easily access vegetables and fruits.	101	95.3
Encouraging farmers to do exercise for their health	98	92.5
Urban wastes can be reduced.	97	91.5
People can generate sources of income.	93	87.7
It helps urban poor save their money to buy food sources.	92	86.8
Price of food sources from the garden is cheaper than from the market.	83	78.3

Source: own study.

respondents disagreed about the lack of awareness and promotion programmes delivered to urban farmers (35.8%), and 45.3% of them also do not have difficulties in receiving technical support from the authorities or NGOs to improve their knowledge on urban gardening. The result also shows that 50.0% and 54.7% of them do not face any problems with access to training and consultation from relevant agencies and access to online information related to local urban farming, respectively.

Table 3. Prioritising challenges facing urban gardens.

	Mean	Standard deviation	Priority
Highly fluctuating weather will affect the yield	3.76	1.06	1
Access to available land is a major problem	3.65	1.07	2
Financial problems is the main issue	3.48	1.11	3
Increased number of pests	3.48	0.89	4
Shortage in the number of members to help in managing the garden	3.47	1.07	5
Price of pesticide in the market is too high	3.41	1.15	6
Flood will damage the yields	3.40	1.18	7
Hard to access financial institutions to lend money	3.40	1.03	8
Rain will reduce soil fertility	3.34	1.08	9
Lack of rain reduces water availability	3.29	1.01	10
I am afraid of my produce being stolen	3.25	1.29	11
Most of the available land belongs to private owners	3.19	1.08	12
Available land is contaminated	3.09	1.09	13
Hard to get volunteers to manage the garden	3.09	1.04	14
Need to compete for available land with industries	3.08	1.16	15
Lack of commitments from communities	2.99	1.02	16
Lack of marketing skills	2.97	0.99	17
Lack of cold storage	2.96	1.26	18
Difficult to access financial resources from the government	2.90	0.98	19
Hard to get regular customers	2.82	1.02	20
Hard to buy cheap fertiliser near the garden	2.81	1.14	21
Hard to find a leader	2.81	1.18	22
Hard to access water supply near the garden	2.80	1.23	23
Lack of equipment and tools	2.76	1.17	24
Price for the produce is too low	2.70	1.03	25
Lack of awareness and promotion programmes delivered to urban farmers	2.67	0.95	26
Inability and lack of supply of seed	2.61	1.13	27
Mostly selling produce to middlemen	2.49	1.16	28
Farm is located far from supermarkets	2.34	0.96	29
Difficult to get training and consultation from relevant agencies	2.28	0.86	30
Difficult to access technical support from authorities or non-governmental organisations to improve knowledge	2.12	0.86	31
Hard to access local urban farming information online	1.95	0.79	32

Source: own study.

Table 4. Technical constraints.

Constraint	SD freq., %	D freq., %	N freq., %	A freq., %	SA freq., %
Lack of awareness and promotion programmes delivered to urban farmers	11 (10.4)	38 (35.8)	32 (30.2)	25 (23.6)	0 (0.0)
Difficult to access technical support from authorities or non-governmental organisations to improve knowledge	26 (24.5)	48 (45.3)	25 (23.6)	7 (6.6)	0 (0.0)
Difficult to get training and consultation from relevant agencies	16 (15.1)	53 (50.0)	31 (29.2)	3 (2.8)	3 (2.8)
Hard to access local urban farming information online	29 (27.4)	58 (54.7)	15 (14.2)	3 (2.8)	1 (0.9)

SD – strongly disagree, D – disagree, N – neutral, A – agree, SA – strongly agree
Source: own study.

Resource-related factor

Table 5 shows the constraints on access to resources faced by urban practitioners. The majority (53.8%) of them agreed on facing problems with access to available land, and 35.8% of the respondents also agreed that the available land belonged to private owners. However, 28.3% of them had a neutral opinion regarding having to compete with industries for available land. Table 5 also shows that 33.0% of them agreed that the available land was contaminated, and 35.8% of the respondents do not have any problem with access to water supply. Besides, 31.1% of the respondents faced the problem of high price of pesticides. Access to fertilisers (31.1%), lack of seed supply (38.7%) and complete equipment for their gardening activities (36.8%) are not major problems in this study.

Economic factor

Table 6 shows that the majority of the respondents agreed that the financial problem was the main issue (39.6%) in implementing and managing the urban garden. However, 44.3% and 42.5% of them have a neutral opinion regarding easy access to financial resources from the government and lack of marketing skills. Besides, 40.6% of them face problems with access to financial institutions lending money. Table 6 also shows that the majority of urban farmers disagree on the price of produce being too low and whether it is hard to get regular customers, with percentages of 36.8% and 33.0%, respectively. The majority of them also do not agree about the need to sell the product to a middleman (35.8%) and on the farm being located far from the supermarket (38.7%). In addition, 38.7% of them have a problem with a lack of cold storage.

Social factor

Table 7 shows that most of the respondents (37.7%) have a neutral opinion about the shortage of members to help in managing the garden. However, 33.0% and 35.8% of the respondents have a problem accessing volunteers and lack of commitment from the public to help them in

Table 5. Resource-related constraints.

Constraint	SD freq., %	D freq., %	N freq., %	A freq., %	SA freq., %
Access to available land is a major problem	6 (5.7)	12 (11.3)	13 (12.3)	57 (53.8)	18 (17.0)
Most of the available land belongs to private owners	8 (7.5)	20 (18.9)	31 (29.2)	38 (35.8)	9 (8.5)
Need to compete for the available land with industries	10 (9.4)	25 (23.6)	30 (28.3)	29 (27.4)	12 (11.3)
Available land is contaminated	9 (8.5)	23 (21.7)	31 (29.2)	35 (33.0)	8 (7.5)
Hard to access water supply near the garden	14 (13.2)	38 (35.8)	21 (19.8)	21 (19.8)	12 (11.3)
Price of pesticide in the market is too high	7 (6.6)	16 (15.1)	30 (28.3)	33 (31.1)	20 (18.9)
Hard to buy cheap fertiliser near the garden	14 (13.2)	33 (31.1)	23 (21.7)	31 (29.2)	5 (4.7)
Inability and lack of supply of seed	16 (15.1)	41 (38.7)	23 (21.7)	20 (18.9)	6 (5.7)
No access to equipment and tools	13 (12.3)	39 (36.8)	23 (21.7)	22 (20.8)	9 (8.5)

SD – strongly disagree, D – disagree, N – neutral, A – agree, SA – strongly agree
Source: own study.

Table 6. Economic constraints.

Constraint	SD freq., %	D freq., %	N freq., %	A freq., %	SA freq., %
Financial problem is a main issue	9 (8.5)	7 (6.6)	31 (29.2)	42 (39.6)	17 (16.0)
Difficult to access financial resources from the government	9 (8.5)	24 (22.6)	47 (44.3)	21 (19.8)	5 (4.7)
Hard to access financial institutions to borrow money	3 (2.8)	21 (19.8)	26 (24.5)	43 (40.6)	13 (12.3)
Lack of marketing skill	8 (7.5)	23 (21.7)	45 (42.5)	24 (22.6)	6 (5.7)
Price for the produce is too low	11 (10.4)	39 (36.8)	31 (29.2)	21 (19.8)	4 (3.8)
Hard to get regular customers	9 (8.5)	35 (33.0)	32 (30.2)	26 (24.5)	4 (3.8)
Mostly sell produce to middlemen	22 (20.8)	38 (35.8)	26 (24.5)	12 (11.3)	8 (7.5)
Farm is located far from supermarkets	21 (19.8)	41 (38.7)	33 (31.1)	9 (8.5)	2 (1.9)
Lack of cold storage	16 (15.1)	29 (27.4)	12 (11.3)	41 (38.7)	8 (7.5)

SD – strongly disagree, D – disagree, N – neutral, A – agree, SA – strongly agree
Source: own study.

the garden. Besides, most of them (34.0%) do not have a problem finding a leader for their urban garden project. The result also shows that farm theft (25.5%) is not a major problem among urban farming practitioners.

Environmental factor

Table 8 shows that the majority of the respondents (36.8%) have a problem with highly fluctuating weather that affects their yield production. Thus, 39.6% of them agree that rain will reduce soil fertility, and 48.1% agree that lack of rain will reduce the availability of water for their uses. The majority (37.7%) of the urban farming practitioners agree that flood will damage their yields, and 49.1% of them agree that highly fluctuating weather will increase the number of pests.

Table 7. Social constraints.

Constraint	SD freq., %	D freq., %	N freq., %	A freq., %	SA freq., %
Shortage in the number of members to help in managing the garden	4 (3.8)	13 (12.3)	40 (37.7)	27 (25.5)	22 (20.8)
Hard to get volunteers to manage the garden	6 (5.7)	27 (25.6)	31 (29.2)	35 (33.0)	7 (6.6)
Lack of commitment from the public	10 (9.4)	23 (21.7)	33 (31.1)	38 (35.8)	2 (1.9)
Hard to find a leader	13 (12.3)	36 (34.0)	25 (23.6)	22 (20.8)	10 (9.4)
I'm afraid of having my produce stolen.	9 (8.5)	27 (25.5)	22 (20.8)	25 (23.6)	23 (21.7)

SD – strongly disagree, D – disagree, N – neutral, A – agree, SA – strongly agree
Source: own study.

Table 8. Environmental constraints.

Constraint	SD freq., %	D freq., %	N freq., %	A freq., %	SA freq., %
Highly fluctuating weather will affect the yield	4 (3.8)	8 (7.5)	26 (24.5)	39 (36.8)	29 (27.4)
Rain reduces soil fertility	7 (6.6)	16 (15.1)	29 (27.4)	42 (39.6)	12 (11.3)
Lack of rain reduces water availability	5 (4.7)	22 (20.8)	22 (20.8)	51 (48.1)	6 (5.7)
Flood will damage the yields	8 (7.5)	18 (17.0)	22 (20.8)	40 (37.7)	18 (17.0)
Increase in the number of pests	3 (2.8)	11 (10.4)	32 (30.2)	52 (49.1)	8 (7.5)

SD – strongly disagree, D – disagree, N – neutral, A– agree, SA – strongly agree
Source: own study.

Table 9. Correlation coefficient (r) between the socio-demographic background and the challenges of urban gardens.

		Technical	Resource-related	Economical	Social	Environmental
Gender	Spearman rho	−0.031	−0.173	−0.166	−0.058	−0.062
	Significance	0.750	0.077	0.089	0.552	0.527
Age	Spearman rho	−0.031	−0.131	−0.103	−0.164	−0.410**
	Significance	0.753	0.179	0.294	0.193	0.0
Race	Spearman rho	0.210*	−0.051	−0.112	0.201*	−0.149
	Significance	0.031	0.603	0.255	0.039	0.128
Education level	Spearman rho	0.225*	0.041	−0.088	0.021	−0.097
	Significance	0.021	0.674	0.370	0.830	0.323
Number of people in households	Spearman rho	−0.177	−0.047	0.111	0.072	0.109
	Significance	0.070	0.631	0.256	0.464	0.267
Monthly household income	Spearman rho	0.043	−0.126	−0.223*	−0.119	−0.197*
	Significance	0.660	0.199	0.021	0.226	0.043
Experience	Spearman rho	−0.143	0.018	−0.003	−0.052	−0.002
	Significance	0.143	0.857	0.979	0.594	0.981

*Correlation is significant at the 0.05 level.
**Correlation is significant at the 0.01 level.
Source: own study.

Correlation analysis

Table 9 shows the correlation between socio-demographics and the challenges of an urban garden. The result reveals that there is a significant relationship between the age and the environment, with a value of −0.410. It also shows that there is a weak correlation between technical factors and race, with a value of 0.210, and the education level, with a value of 0.225 at a significant level of 0.05. The value of 0.201 for the correlation between the social factor and race at a significance level of 0.05 also shows that these have a weak correlation. The monthly household income also has a weak correlation with the economic factor, with a value of −0.223, and the environmental factor, with a value of –0.197 at a significance level of 0.05.

Discussion

Urban gardens play an important role in producing food sources, which makes it crucial in most developing countries. It is generally believed that the urban garden has the potential to enhance food availability, access and utilisation, especially among the urban poor. Besides, it also has the potential for improving the urban environment. As a result, from the socio-demographic profiles of respondents, this study has revealed that among urban farmers, females are predominant because there is a perception in societies that women have the responsibility to ensure safe food supply to their family members (Kutiwa et al. 2010), and also this activity meshes well with women's other household activities such as cooking and childcare (Islam, Siwar 2012). Besides, 48.1% of the urban farmers involved in this survey are within the age group of 41–60, and the majority have received tertiary education. This is in line with a study by Rezai et al. (2016), wherein young urban dwellers with higher education are more involved in urban farming activities. Furthermore, 50.0% of the urban farming practitioners have between four to six people per house, and 47.2% have a household income of ≤RM 3,000, which falls under the bottom 40% (B40) income group (Department of Statistics Malaysia, 2017). It is also in line with a previous study (Islam, Siwar 2012), where the urban garden is important for the urban poor to produce their own food.

Many benefits of gardening activities for urban farming practitioners towards food security are listed in this study. According to Table 2, the majority (98.1%) of the respondents are aware that the urban garden is the government's green initiative to enhance a sustainable urban environment because a high-density urban environment has an impact on the quality of city residents' lives, and increases the awareness of people living in cities to take action in creating a better environment to improve the current quality of life (Lau et al. 2017). According to Lovell (2010), an increasing amount of vegetation through the urban garden project in an urban area helps regulate humidity levels. Besides, the creation of green space in cities can reduce the number of urban wastes and urban heat island effects, in addition to improving the air quality of the surrounding area (Berhanu, Akola 2014). The second-highest benefit mentioned by 97.2% of the respondents is building a social relationship. It is in line with the study by Sanye-Mengual et al. (2016), where the purpose of involvement among urban farmers in Barcelona is more for leisure and social activity than for food production activity. This practice allows urban farming practitioners to meet their friends for four to five hours per day at the garden plot (Sauyah, personal interview, 14 March 2020).

Meanwhile, the perspective of urban farmers on the benefit of the urban garden for food security (the third highest: 95.3% of the respondents) is that safe and more nutritious food can be produced through the urban garden, and it can also help people in cities gain easier access to vegetables and fruits (Taylor, Lovell 2014). These three are related to the components of food security. According to Brüssow et al. (2017), the four components in achieving food security are availability, access and utilisation, underlined by stability. A study by Park et al. (2011) shows that the urban garden can make food accessible to residents and can also increase the consumption of fresh produce (Corrigan 2011). For instance, growing the vegetables daily helps improve the availability and accessibility of fresh food among households in Putrajaya (Rezai et al. 2016). Besides, the urban garden also helps produce food sources closer to consumers (Lovell 2010). Furthermore, most

of the urban women farmers become involved in crop farming to cater to the family's demand for fresh, nutritious and agrochemical-free food (Gamhewage et al. 2015).

Table 3 reveals the prioritising challenges related to the urban garden faced by urban farmers in Kuala Lumpur. The results show that the main barrier to the urban garden in Kuala Lumpur is highly fluctuating weather. Highly fluctuating weather will affect the crop's yield. According to Alam et al. (2011), a low level of rainfall can be overcome by farmers with irrigation, but high rainfall will lead to damage to output and serious damage to crops at the end of the crop cycle. Besides, an increase in rainfall and temperature also causes agricultural production losses of between RM 37 and RM 48 per hectare in Peninsular Malaysia, Sabah and Sarawak (Zainal et al. 2012). The second major barrier in this study is the problem of access to available land. Findings by Hussain et al. (2019) show that planting in the pot is a popular method because of limited open spaces in some residential areas and it is also portable and easy to handle within a small compound. On the other hand, the lack of space for farming activities in Edible Garden City, Singapore, is due to the restriction of the legal framework on land use (Low 2019). Besides, contaminated land also contributes to limited land availability in cities. According to Nabulo et al. (2012), land contamination in Kampala, Uganda, is caused by the waste disposal practice, which has led to health concerns due to the presence of toxic elements in the vegetables grown in an urban area. The third major barrier is a financial constraint. It is similar to the finding by Ramaloo et al. (2018): farmers in Taman Desa Damai Community Garden at Bukit Mertajam face financial constraints to pay the rental fees on land use and domestic water supply. Besides, lack of capital causes difficulties among farmers in purchasing adequate amounts of fertilisers and pesticides (Makuvaro et al. 2017).

Table 4 shows the challenges faced by urban farmers related to technical factors. Most (35.8%) of the respondents in this study do not have any problem with urban garden knowledge because there have been enough awareness and promotion programmes related to urban gardens, such as an exhibition by Malayan Agri-Horticulture Association (MAHA) (Ali, personal interview, 14 March 2020). Besides, 45.3% and 50.0% of urban farming practitioners can access technical support and training and consultation services from the government and NGOs. It is in contrast with the findings by Adeoti et al. (2011), where 50.0% of farmers in Accra, Ghana, never receive advice facility from the authorities. According to Singh et al. (2015), training can provide more information related to agriculture activities. Thus, a study by Gamhewage et al. (2015) shows a lack of knowledge among women involved in urban farming in Sri Lanka, causing difficulty in identifying diseases, pest attacks and nutrient deficiencies. The role of knowledge is also important to increase the number of participants in this practice (Azman et al. 2013; Shamsudin et al. 2014) whereby knowledge builds a favourable attitude of the public towards the urban garden**.** In addition, 54.7% of urban farmers disagree that it is difficult to access online urban farming information because a lot of information about not only urban farming but also everything on agriculture has been provided by the government and NGOs online.

The data on resource-related constraints in Table 5 show access to available land is a challenge among 53.8% of the urban farmers involved in this study. It is similar to the study by Pearson et al. (2010), where the primary constraint in Australia is to protect and preserve land because of intense competition with other land uses. Besides, limited land is available in Singapore for farming activities because of the restricted legislative regulatory framework on land use, whereby no land is allowed for farming for social purposes, and the land that is set aside for community purposes cannot be used for farming (Low 2019). The high price of land in cities is also one of the reasons, as shown in a study by Moglia (2014), wherein the cost of available land for agriculture around Kalkallo is reported to be as high as AUS$ 100 000 per hectare. Furthermore, 33.0% of urban farmers in this study face problems with contaminated land. This phenomenon has been proved in a study by Säumel et al. (2012), where the vegetables produced in the city contain a high amount of trace metals. The contaminant can come from waste disposal practices similar to the occurrence in Kampala, Uganda, where the waste disposal practice contaminates the land and it affects human health because of toxic elements,

such as cadmium, chromium and lead contained in the vegetable (Nabulo et al. 2012).

Table 6 also reveals that 35.8% of the respondents have agreed that the available land belongs to a private owner. According to Asomani-Boateng (2002), there are issues related to private owners, whereby they tend to sell their plots to residential and commercial developers, who are usually the highest bidders. The high price of pesticides is one of the issues reported by 33.1% of urban farmers. It is similar to the study by Makuvaro et al. (2017), where a shortage of pesticides used to control pests and diseases is faced by farmers in Lower Gweru due to lack of capital. However, the majority of urban farming practitioners in this study do not have difficulties in accessing seed, fertiliser and complete equipment. It contrasts with the finding by Gamhewage et al. (2015), where the third major constraint of urban farming in Sri Lanka is the poor quality of input, such as the unsatisfactory quality of planting material and poor soil fertility. The urban farming practitioner received the inputs such as seeds, fertilisers and some equipment from the Department of Agriculture during the early stages of involvement in this practice (Norizai, personal interview, 14 March 2020).

The data regarding economic factors reported in Table 7 revealed that the majority (39.6%) of urban farmers had to face financial problems similar to farmers in Kenya, who were affected by the financial constraint to adopt urban agriculture (Muriithi 2013). This is because urban gardens require a large investment in terms of operational cost, infrastructure, energy and management (Valk 2012). The difficulty in getting access to financial institution is agreed by 40.6% of the respondents in this study. This might be happening because of a lack of information among farmers about available sources of lenders and the type of credits offered in their area. Besides, commercial banks do not lend money to agricultural enterprises because it is risky (Adeleke et al. 2010). However, 35.8% of the respondents do not need to sell their products through a middleman because most of them (33.0%) have regular customers. All the vegetables are sold to the regular customer directly at the garden or at Farmer's Markets (Hamidah, personal interview, 14 March 2020). Next, according to Antwi and Seahlodi (2011), marketing constraints include limited knowledge, lack of access to high-value reliable markets, distance from markets, poor quality of products, lack of storage facilities, poor agricultural extension services and lack of financial support. It is in line with this study, where 38.7% of the respondents have a problem storing their produce in the absence of cold storage. The study by Aarthi Dhakshana and Rajandran (2017) shows that farmers in Thanjavur cannot afford to purchase cold storage due to lack of capital, which has an impact on farmers' marketing . According to Cong and Baldeo (2006), lack of storage facilities will lead to reducing the quality of the produce, increasing the humidity of the produce and increasing the produce loss.

According to Noriah Mat, Senior Deputy Director of Putrajaya Corporation Landscape and Parks Development, the challenge of Community Garden Programmes is attracting volunteers (*The Star* 2014). This is similar to this study based on the data for social constraints in Table 7, where 33.0% of urban farming practitioners face a shortage of volunteers, which is derived from a lack of commitment from the public, mentioned by 35.8% of the respondents. A finding by Gamhewage et al. (2015) shows that the constraint faced by women participants in this practice is insufficient time because they need to spend more time on household care and management. This study also shows that most women not participating in this practice were job holders. In a study by Othman et al. (2017), urban farming practitioners spent from four to five days per week in the garden after finishing work and during weekends. Furthermore, a study by Ramaloo et al. (2018) shows a lack of participation among young people in this practice because they considered community gardens as non-profit activities. It causes difficulty in managing such garden activities as weeding, watering, harvesting and replanting (Au Yong, personal interview, 1 May 2020). Moreover, finding a leader and farm theft are not major problems in this study, but are similar to the findings of Ober Allen et al. (2008) and Bradley and Galt (2014), where the implementation of community gardens in cities is less likely to support crime or vandalism. However, 23.6% of the respondents experienced this issue. The high-quality fences that were installed in the garden area (Yusof, personal interview, 12 March 2020) as well as the plants and machines that were used for farming

activities were stolen in the night (Jamil, personal interview, 14 March 2020).

Environmental issues constitute one of the factors that can have a negative impact on farming activities and food supply. The data in Table 8 show that highly fluctuating weather is a challenge faced by 36.8% of the respondents in this study. A study by Alam et al. (2013) shows a decline in crop production in Malaysia because of the fluctuation of rainfall between –30.0% and +30.0%, which also leads to drought in many areas. Table 8 reveals that 48.1% of the respondents agree that lack of rain will reduce the water availability. According to Gornall et al. (2010), 80.0% of agriculture depends on rainwater. Thus, the poor rainfall pattern and the amount received in Lower Gweru and Lupane communal areas lead to poor production of crops, hunger, shortage of grazing and, finally, low animal productivity (Makuvaro et al. 2017). Moreover, warmer temperatures increase the plant stress, which require greater water input (Wortman, Lovell 2013). On the other hand, 37.7% of urban farmers agreed that flood disasters can damage the yield. It is shown in a study by Jega et al. (2018) that floods in Kelantan affected almost all the crops, livestock and some agricultural assets. Climate change also contributes to the increase of pests and diseases in the garden area, faced by 49.1% of the urban farming practitioners in this study. A previous study by Rahim (2014) shows that changes in rainfall pattern and increase in temperature will cause the quick spread of fungus and diseases, which affects the yield in the agriculture sector in Malaysia. Besides, another impact of the increasing number of pests is also the overuse of pesticides and reduction in biodiversity (Al-Amin and Siwar 2008).

Based on the correlation analysis results in Table 9, the value of the technical factor and race is 0.210, with a significance level of 0.05. It indicates there is a weak positive correlation between the variables. According to Carstens (2005), the Chinese have a better education than other races, which makes them more aware of the environment. This is because they have a long history of living in cities and are the first- or second-generation urban dwellers. Next, the value of the technical factor and education is 0.225, with a significance level of 0.05, which shows that there is a weak positive correlation. According to Singh et al. (2015), training can provide more information, knowledge and exposure of urban farmers to innovations related to agricultural activities.

The results in Table 9 also show that the value of the social factor and race is 0.201 at the significance level of 0.05, which shows that there is a weak positive relationship. The finding by Othman et al. (2019) shows that the Chinese have higher social motivations than the Malays and Indians in the context of urban farming. This is because the Chinese have higher physical and mental health motivation than Malays and Indians because they are predominantly employed as entrepreneurs and employees (Department of Statistics Malaysia, 2016). Table 9 also shows that there is a strong negative correlation between the environmental factor and age, with a value of –0.410 at the significance level of 0.01. According to Barthel and Isendahl (2013b), experience in farming is very important and it can be gained through years of practice. It means that young farmers have higher possibility of being vulnerable to the impact of climate change than older farmers because of a lack of experience in farming activities. This study also shows that monthly household income has a weak negative correlation between the economic factor (–0.223) and the environmental factor (–0.197) at the significance level of 0.05. This is because urban gardens require a large investment for operational cost, infrastructure, energy and management (Valk 2012). Besides, farmers also need a sufficient amount of money to overcome climate change. According to Makuvaro et al. (2017), farmers tend to apply fertiliser at higher rates than usual under high rainfall conditions and the number of pests will increase due to climate change. However, this study shows that most of the smallholder farmers are unable to purchase an adequate amount of commercial fertiliser because it is very expensive, and lack of capital causes a shortage of pesticides.

Conclusion

This study documented the challenges that urban farmers in Kuala Lumpur faced in managing their gardens in cities. In terms of the socio-demographic profile of the respondents, urban farmers are predominant among females. Most of the

people involved in this urban garden practice are in the age group of 41–60 and have received tertiary education. Furthermore, most of the urban farmers in this study have from four to six people per house and have a household income of ≤RM 3,000. Prioritising challenges faced by urban farmers regarding urban gardens reveals that highly fluctuating weather, problems with access to available land and financial problems are at the top of the list. The main resource-related constraint faced by urban farmers was access to available land, while difficult access to financial institutions was the main economic constraint. Besides, in terms of social factors, the main challenge faced by urban farmers was a lack of commitment from the public due to many factors such as lack of time and lack of interest among young people. The increased number of pests due to highly fluctuating weather, which reduces the productivity and quality of crops was the main issue when it came to environmental factors. Meanwhile, the difficulty in getting training or technical support from the local authorities and NGOs and access to information online under technical factors were among the lowest priorities facing urban garden development. The technical factor has a weak positive correlation with race and the educational level. Besides, the social factor has a weak positive correlation with race, and there is a moderate negative correlation between the age and the environmental factor. There was also a weak negative correlation between household income-related economic factors and environmental factors.

Thus, the community should move towards urban farming—although it seems to be difficult to achieve with its limitations—which is crucial for urban farming to be sustainable. The government needs to publicise more about other alternative gardening practices, such as vertical farming and hydroponics. These alternatives can solve the problems related to contamination and lack of available land. On the other hand, the government and agencies should provide more financial resources to those who need economic help, which can allow them to buy inputs and cold storage to store their produce. The education and training about the choice of planting dates and other suitable crops, soil and water conservation, and regulating the amount of fertilisers should be enhanced to allow farmers to overcome the climate change problem. Besides, the government should plan and make policies specifically to overcome the challenges faced by urban farmers and also for the transformation of urban garden development, where the government should view this urban farming as a catalyst for supporting food security, achieving a better lifestyle for urban residents and the well-being of the natural environment. There is also a need to conduct further research more comprehensively to capture the actions that can be taken to create a policy-making space for urban farmers.

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